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3. The APERC Macroeconomic Model

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Contents

1. Background

- The role of macroeconomic model in the APEC Energy Demand and Supply Outlook

Macroeconomic model

(Population, GDP, Savings rate, Investment rate, Employment rate, Education, etc.)

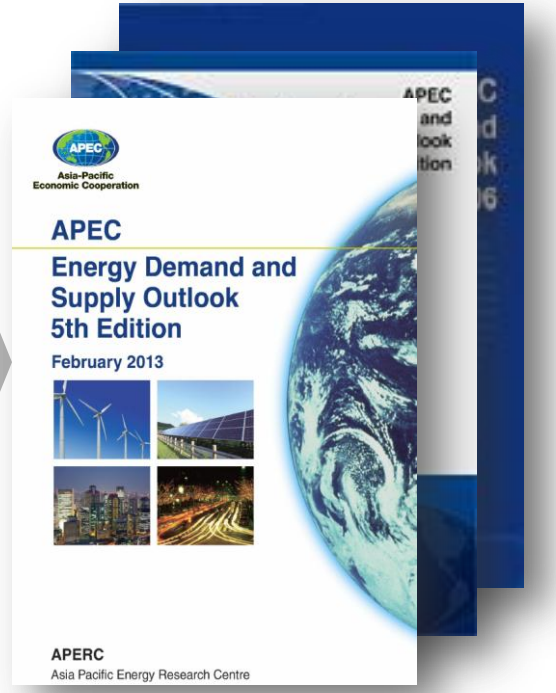
Industry demand model

Transport demand model

Residential & Commercial demand model

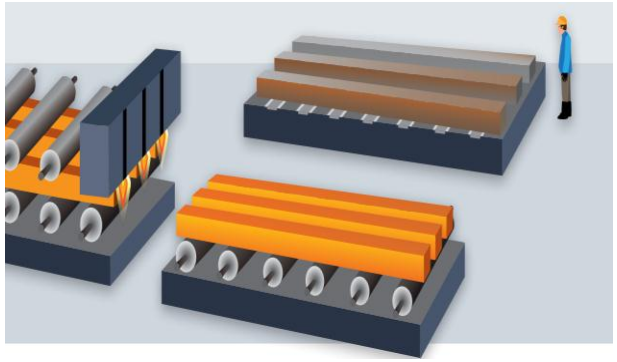
Electricity supply model

Other models …

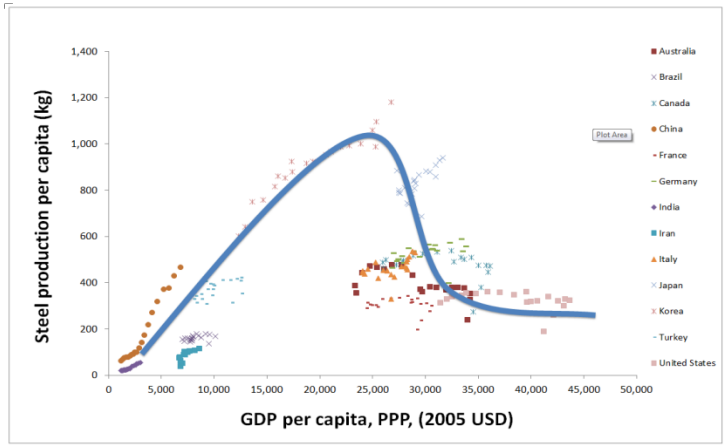


Example of using macroeconomic model

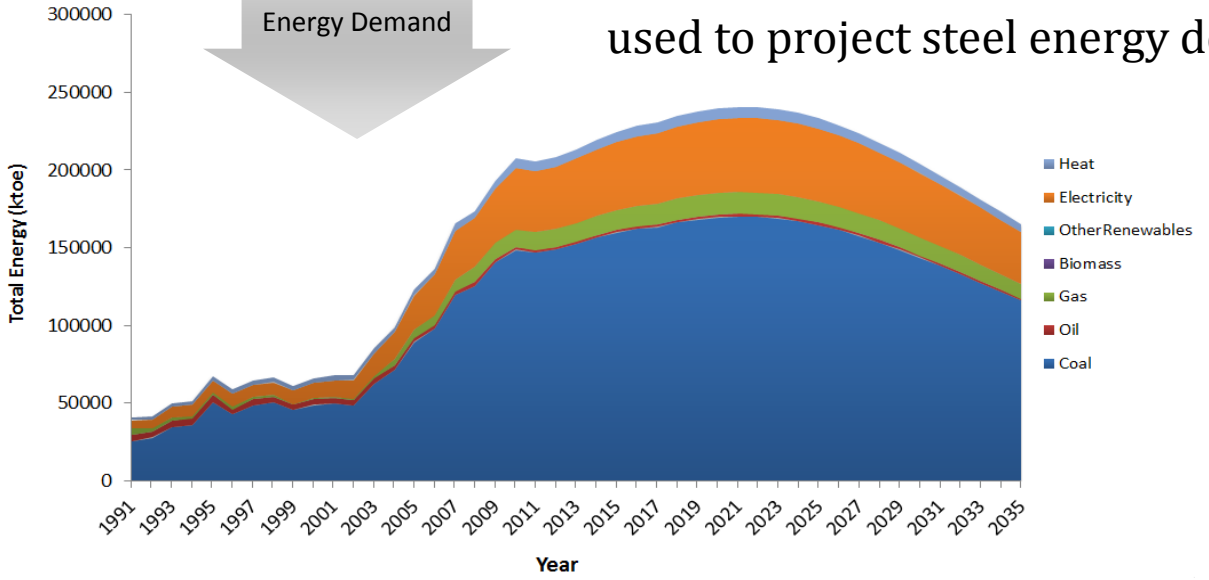
Energy Intensity Data



Steel Production Forecast



Steel Sector Energy Demand



How can the macroeconomic model be used to project steel energy demand?

GDP per capita, Population …

Macroeconomic model

Why do we need a new macroeconomic model?

- Previously we used the IHS Global Insight data as our macroeconomic assumptions.

- Reasons not to use it anymore:
  - ✓ We cannot explain (Models not available)
  - ✓ Data not available for Brunei and PNG
  - ✓ Some strange results (bias toward small economies such as Singapore and Hong Kong)
  - ✓ Expensive…

Why do we need a new macroeconomic model?

- There are currently many other macroeconomic projections. However, it is difficult to use their results directly due to data, document and source code availability, as well as time and economy coverage problems.

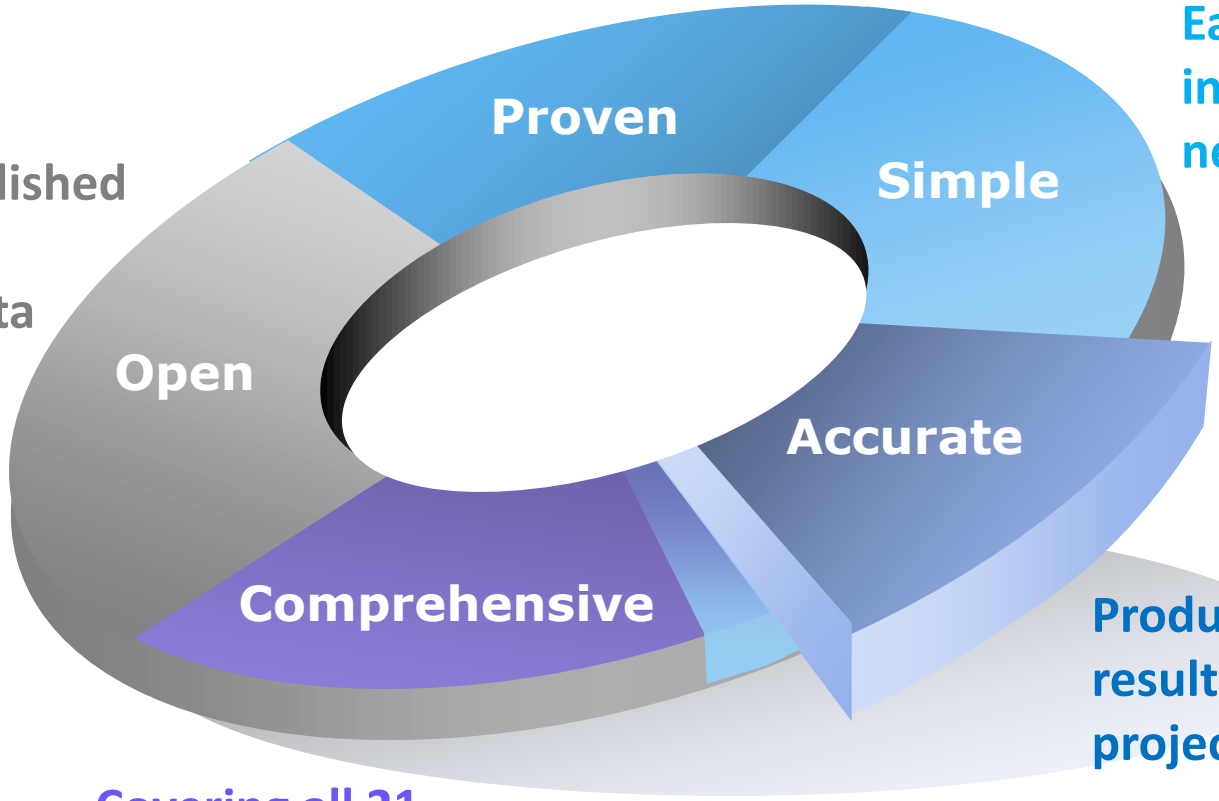
Projections	Time coverage	Economy coverage	Detailed Document	Database	Source Code	Remarks
CEPII	1980-2050, annual	worldwide, 147 economies	O	O	O	using energy as input
EIA	2006-2035, 5-year intervals	22 selected economies	X	X	X	
USDA	1969-2030, annual	worldwide, 190 economies	X	O	X	
IMF	1980-2018, annual	worldwide, 188 economies	X	X	X	
OECD	2011, 2030, 2060	42 selected economies	O	X	X	

The model we are pursuing …

Based on proven, widely adopted approach

Easy to understand, including only the necessary elements

Using open, published research and authoritative data sources



Producing acceptable results for long-term projection

Covering all 21 APEC economies

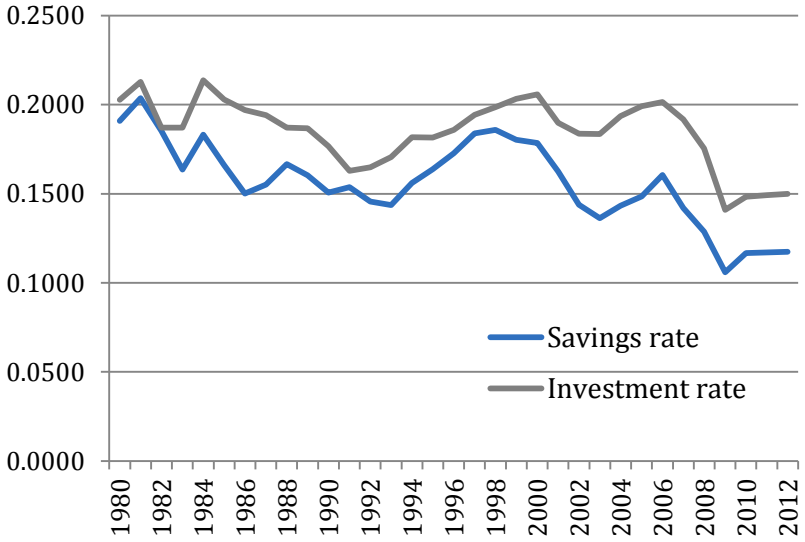
2. Model structure

Total GDP $Y = A(t)K^{\alpha}L^{\beta}$

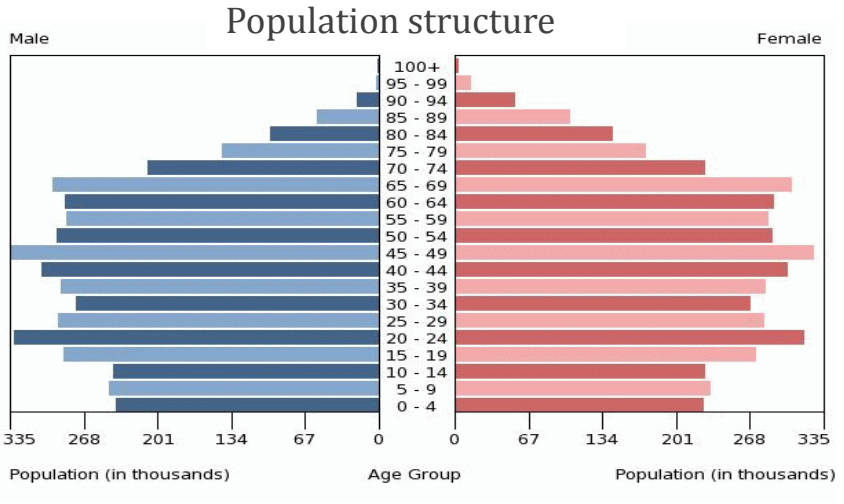
- Total Factor Productivity, TFP (A)
  - Catch-up effect
  - Education effect
- Capital (K)
  - Savings rate
    - Income level
    - Income growth rate
    - Economic activity rate
    - Culture, institutions and other factors
  - Investment rate
    - Relationship between savings and investment rate
    - Regional differences
- Labor (L)
  - Population structure
  - Economic activity rate of age groups

Three main factors in the model

- Capital accumulation is determined by *investment rate* (the share of investment in GDP) and *capital depreciation rate*. investment rate is estimated based on the relationship between savings rate and investment rate.

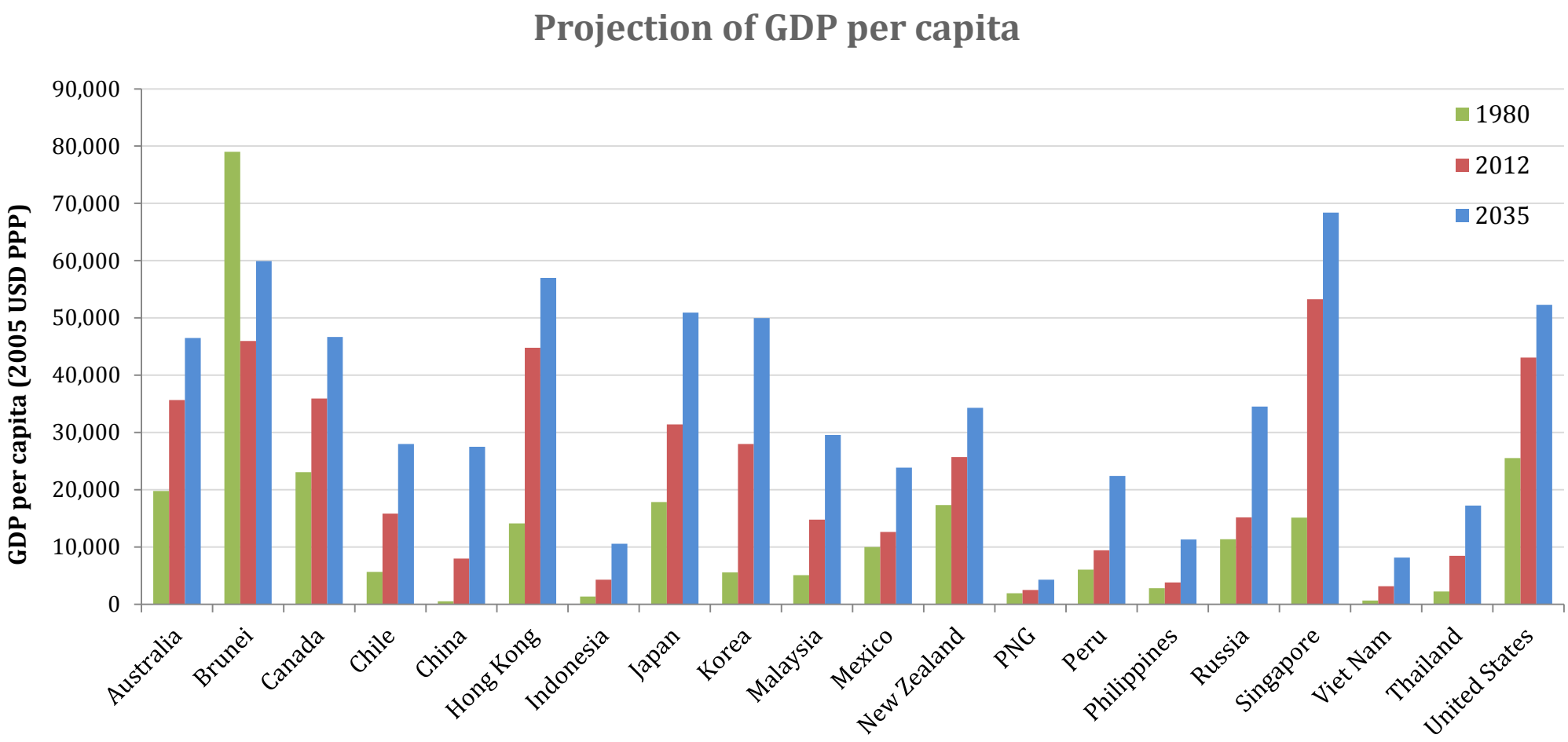


- Labour is measured by the total economically active population. For each age group, we have population and economic activity rate data from the ILO database.

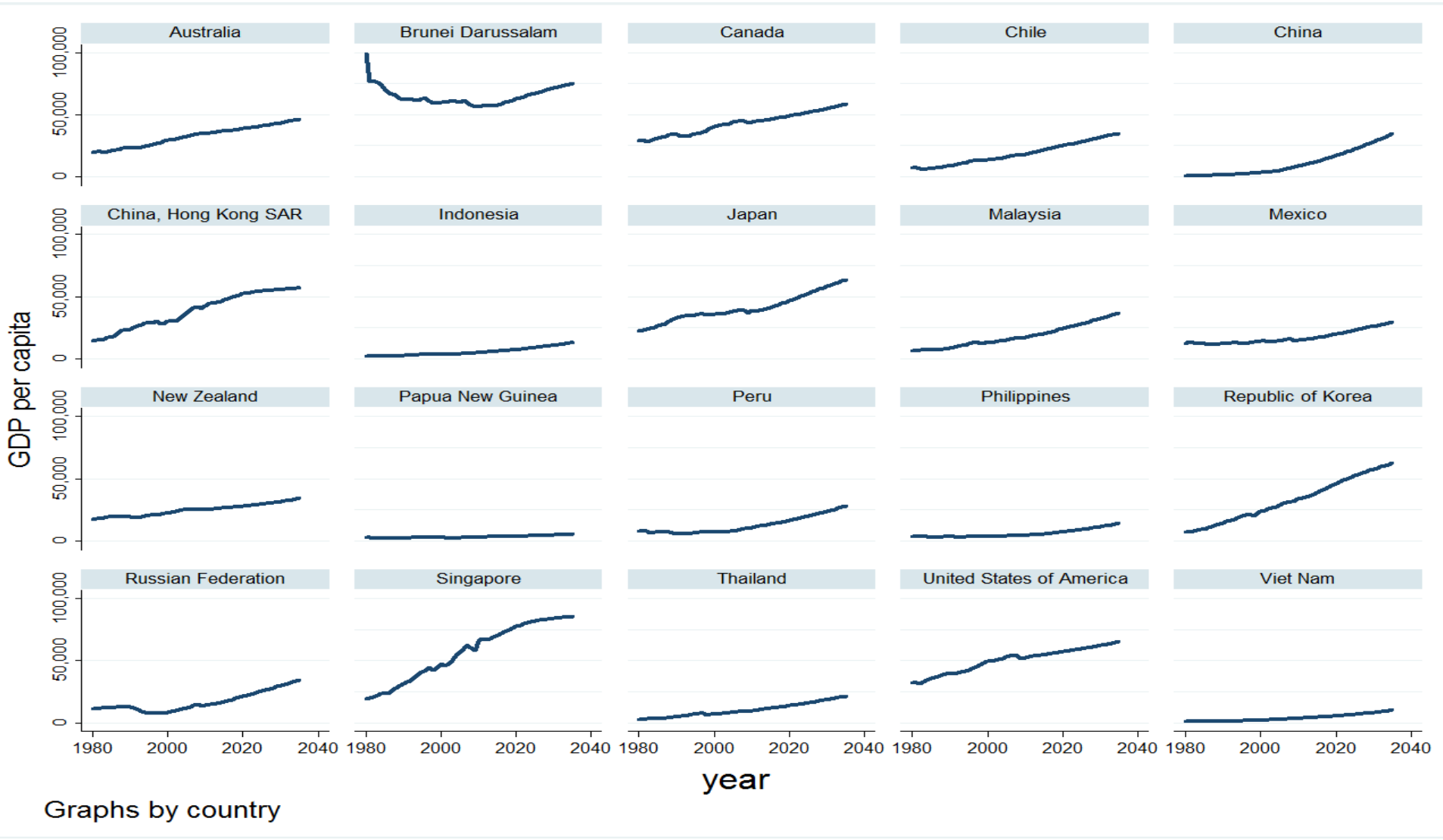


- TFP growth can be explained by a catch-up effect, an education effect and an interaction term between education and catch up.

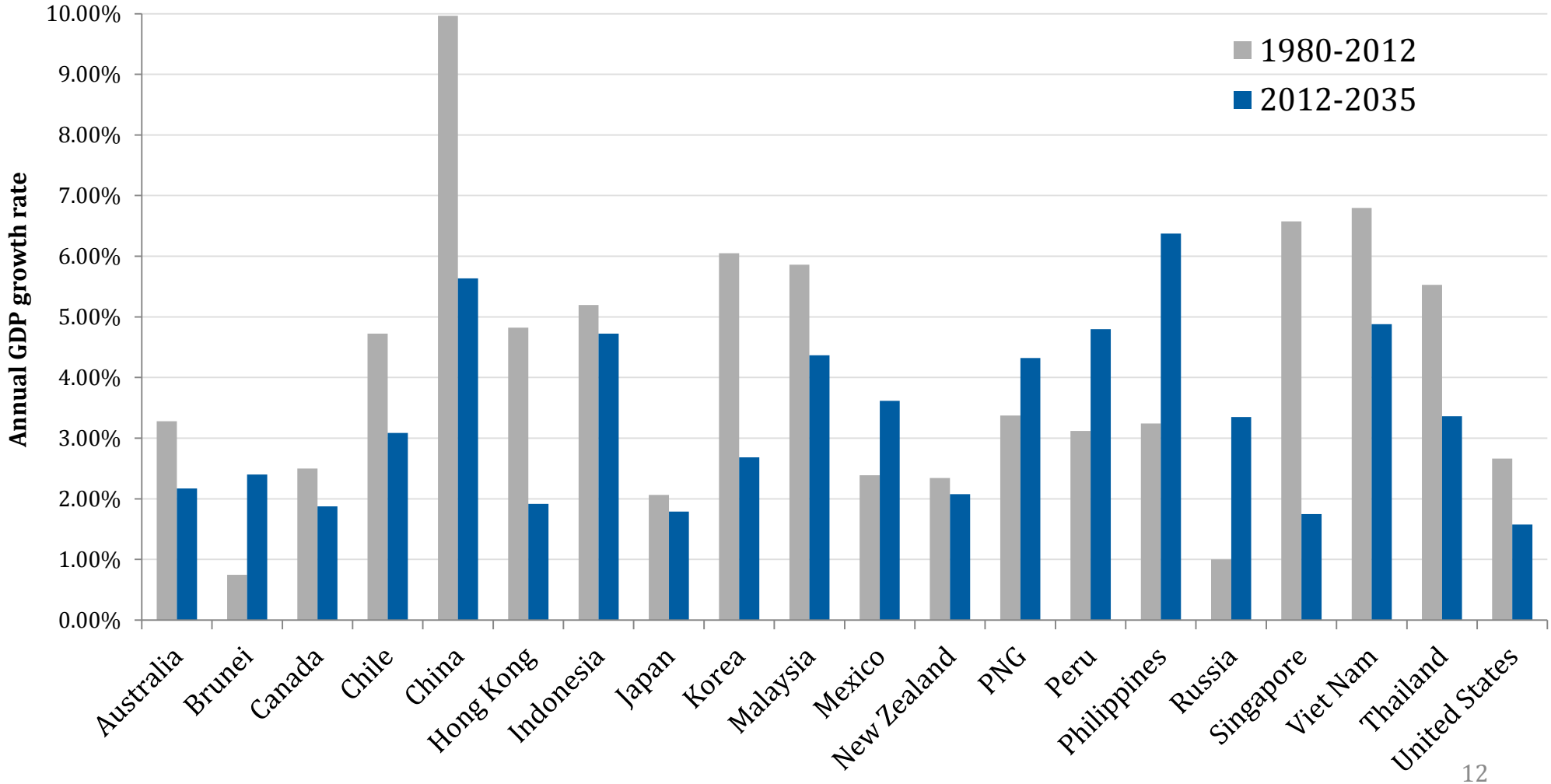
3. Results and Discussions



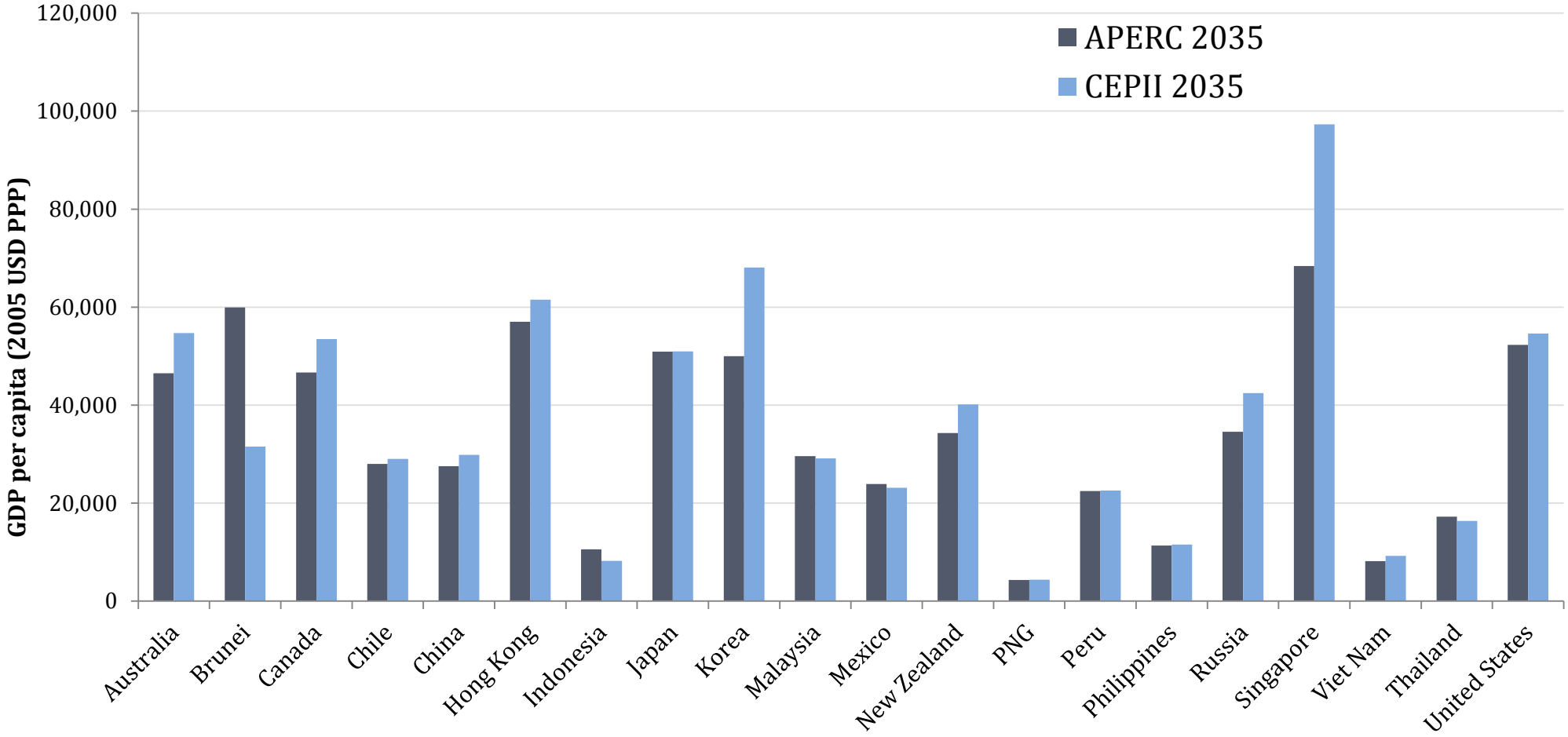
Income growth trend



Total GDP growth rate



Comparison with the CEPII projection



Thanks for your attention!

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